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# Outside Mirrors

Model: E70

Production: From Start of Production

# OBJECTIVES

After completion of this module you will be able to:

- Describe the functions of the Outside Mirrors on the E70.
- Identify the components that make up the Outside Mirrors on the E70.
- Diagnose and service the Outside Mirrors on the E70.

# Introduction

## E70 Outside Mirror Variants

Two versions of the outside mirrors are available for the E70. Electrically adjustable and heated outside mirrors are standard equipment.

Photochromatic Interior and exterior mirrors with automatic dimming function can be ordered as an optional extra. This option requires the interior rear-view mirror with automatic dimming function.

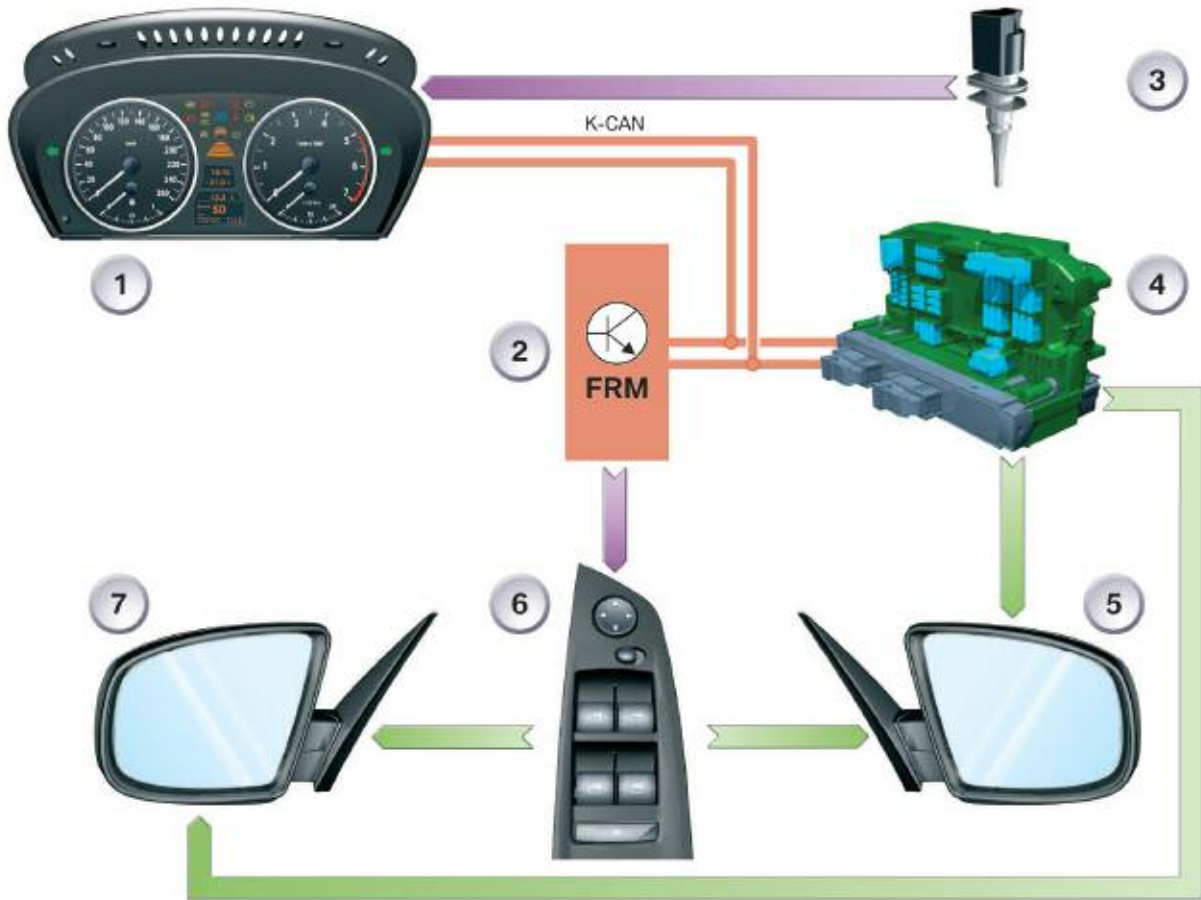
The memory function for the outside mirrors is also available as part of electrical seat adjustment with memory.

The outside mirrors are connected via the LIN-bus and additionally feature the following functions:

- Outside mirror fold-in.
- Photochromatic outside mirrors.
- Electrical seat adjustment with memory (including outside mirror memory).



## Input/output - Outside Mirrors



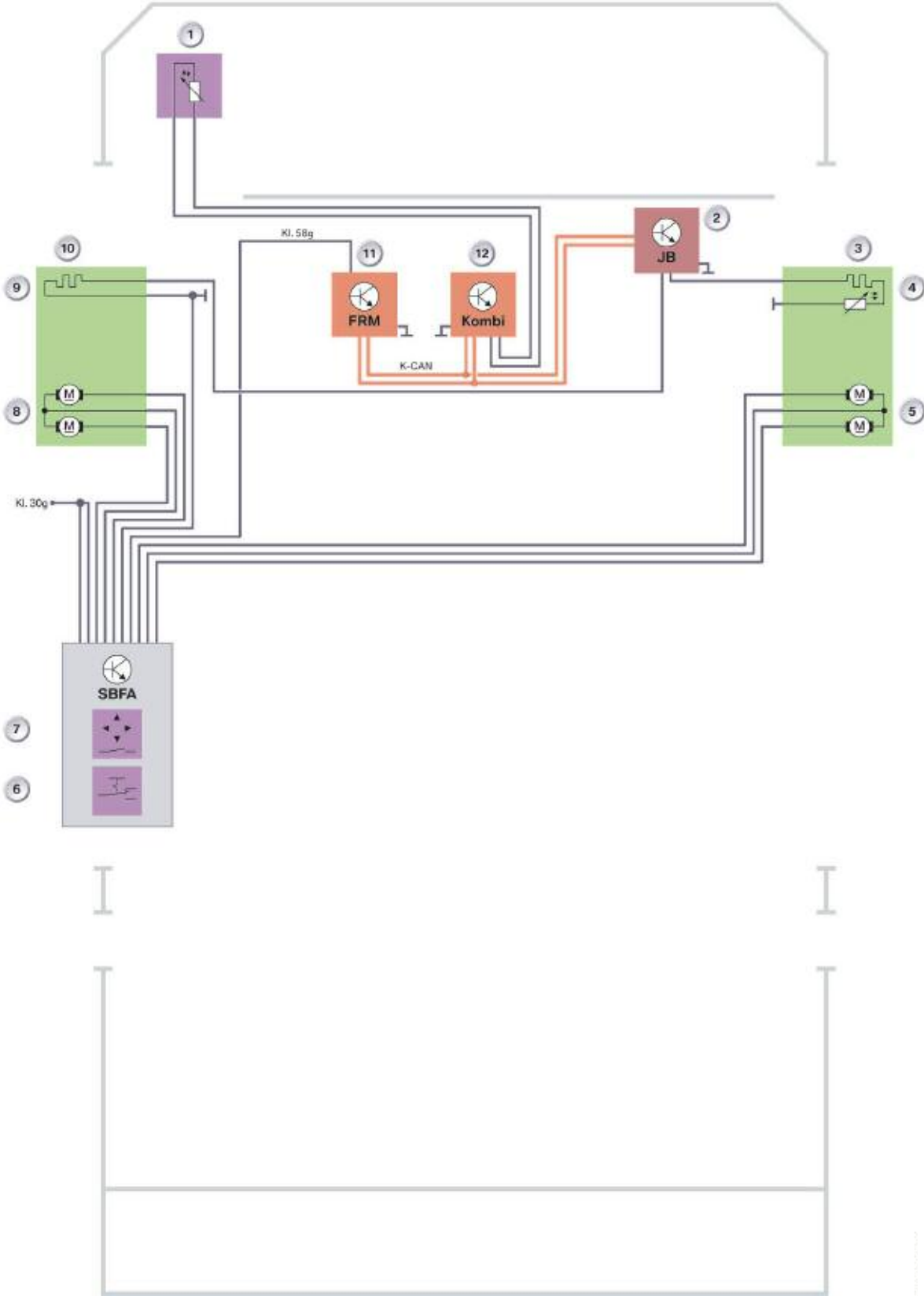
Index	Explanation	Index	Explanation
1	Instrument cluster	5	Outside mirror, passenger's side
2	Footwell module FRM	6	Mirror adjustment switch in driver's door switch cluster SBFA
3	Outside temperature sensor	7	Outside mirror, driver's side
4	Junction box control unit JB	K-CAN	Body CAN

The instrument cluster (1) registers the outside temperature and makes it available to the junction box control unit (4), outside mirror Low (basis version).

The junction box control unit powers the outside mirror heating system. The outside mirrors (5 + 6) can be adjusted with the mirror adjustment switch in the driver's door switch cluster (6).

Note: In the High version of the outside mirrors, the footwell module (2) receives the outside temperature from the instrument cluster. The outside mirrors are connected via the LIN-bus. The footwell therefore requests the mirror heating function via the LIN-bus.

System Circuit Diagram - Standard Outside Mirrors

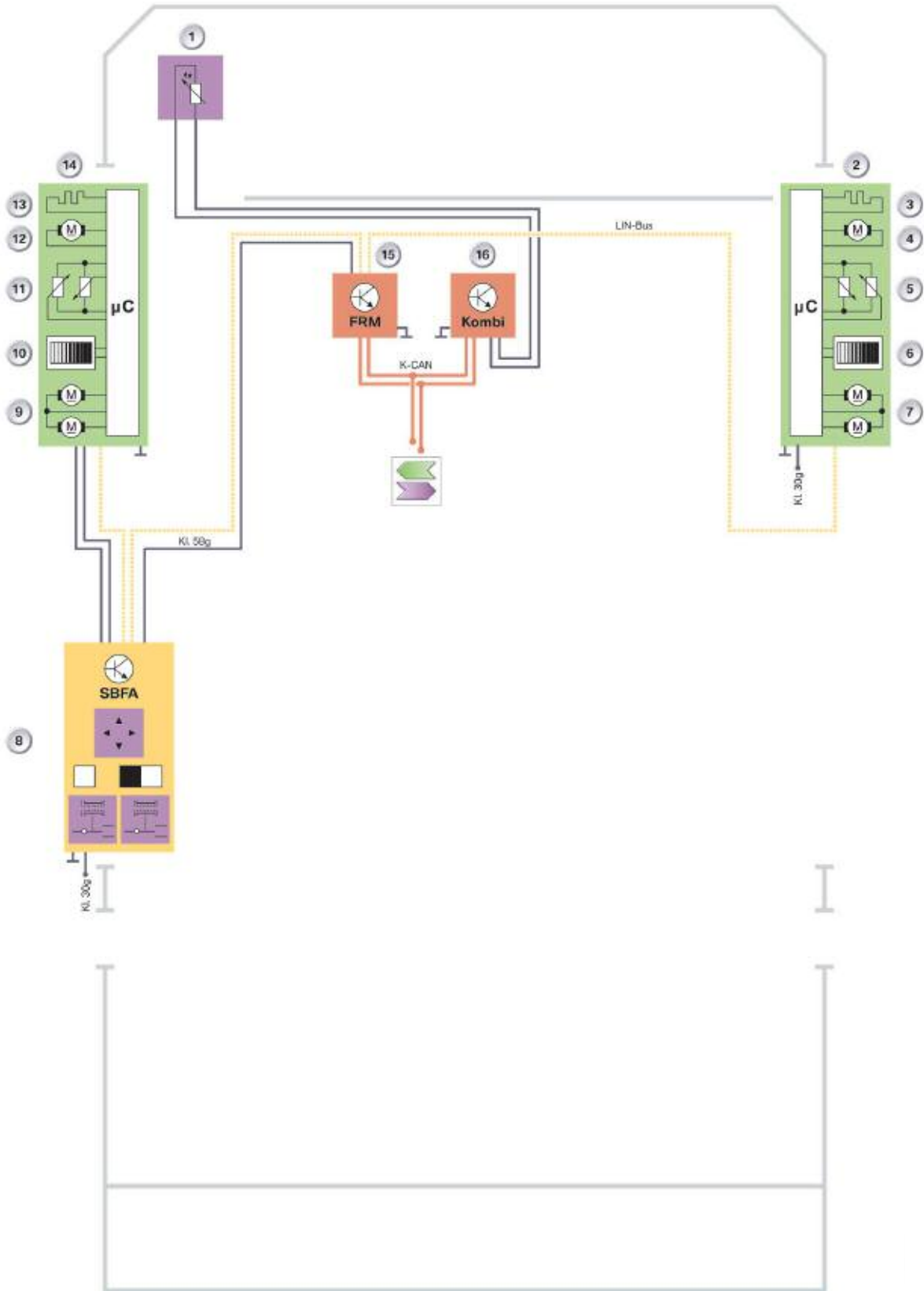


## Legend for System Circuit Diagram - Standard Outside Mirrors

Index	Explanation	Index	Explanation
1	Outside temperature sensor	9	Outside mirror heating, driver's side
2	Junction box control unit JB	10	Outside mirror, driver's side
3	Outside mirror, passenger's side	11	Footwell module FRM
4	Outside mirror heating, passenger's side	12	Instrument cluster
5	Actuator motor for passenger's side outside mirror	K-CAN	Body CAN
6	Mirror selector switch in driver's door switch cluster SBFA	KL30	Terminal 30
7	Mirror adjustment switch in driver's door switch cluster SBFA	KL 58g	Terminal 58g
8	Actuator motor for driver's outside mirror		

The instrument cluster (12) receives value corresponding to the outside temperature from the outside temperature sensor (1) and makes it available to the junction box control unit (2). The junction box control unit activates the outside mirror heating (4 and 9). The mirror adjustment motors (5 and 8) are activated directly by the mirror adjustment switch (7).

Photochromatic Outside System Circuit Diagram





## Legend for Photochromatic Outside System Circuit Diagram

Index	Explanation	Index	Explanation
1	Outside temperature sensor	11	Memory, outside mirror potentiometer, driver's side
2	Outside mirror, passenger's side	12	Motor for folding mirror function, driver's side
3	Outside mirror heating, passenger's side	13	Outside mirror heating, driver's side
4	Motor for folding mirror function, passenger's side	14	Outside mirror, driver's side
5	Memory, outside mirror potentiometer, passenger's side	15	Footwell module FRM
6	Photochromatic outside mirror, passenger's side	16	Instrument cluster
7	Actuator motor for passenger's side outside mirror	LIN-Bus	Local interconnected network bus
8	Driver's door switch cluster SBFA with mirror adjustment switch	KL30	Terminal 30
9	Actuator motor for driver's outside mirror	KL 58g	Terminal 58g
10	Photochromatic outside mirror, driver's side	K-CAN	Body CAN

## K-CAN Signals at Footwell Module

In/out	Information	Source	Function
In	Status, memory position button	Memory button > seat module	Acquisition of outside mirror memory-position
In	Save memory position	Memory button > seat module	Saving memory-position of both outside mirrors
In	Vehicle speed	Wheel speed sensor > dynamic stability control	Mirror fold-in lock (inhibit)
In	Status, electrochromic interior rear-view mirror	Photodiode, interior rearview mirror > roof functions center	Dip outside mirror

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The instrument cluster (16) receives the value corresponding to the outside temperature from the outside temperature sensor (1) and makes it available via the K-CAN. The footwell module (15) evaluates the K-CAN signal and initiates activation of the outside mirror heating (3 and 13).

The mirror adjustment motors (7 and 9) are driven by the electronic mirror module. The electronic mirror module receives the request to adjust the outside mirrors via the LIN-bus.

The outside mirrors are connected via the LIN-bus. All information such as the memory position or mirror functions, e.g. dip outside mirrors, is transferred via the LIN-bus.

Note: The footwell module is the central control unit for the outside mirror functions. The outside mirrors with memory function, photochromatic function and the fold-in function are connected with the LIN-bus.

# Functions

The following outside mirror functions are possible depending on the vehicle equipment:

- Mirror adjustment in up/down and left/right directions.
- Mirror heating.
- Mirror fold-in.
- Photochromatic mirror, outside mirror with memory function.
- Automatic parking function.
- Manual adjustment.
- Motor protection by repeat interlock.

## Mirror Adjustment

### Outside Mirror Adjustment (Standard)

The mirrors can be moved up or down as well as left or right when the mirror adjustment switch is operated. The mirror adjustment switch activates the adjustment motors directly.

The mirror selector switch in the driver's door switch cluster is used to select between the outside mirror adjustment for the driver's door and passenger's door.

The actuator drive unit comes up against a slip clutch when the outside mirror reaches the end stop. This clutch protects the components of the outside mirror from mechanical damage.

### Outside Mirror Adjustment (Photochromatic)

The driver's door switch cluster is connected via the LIN-bus to the footwell module. The footwell module checks the status of the mirror adjustment switch every 20 ms. The electronics in the driver's door switch cluster evaluates the mirror adjustment switch and sends the signal via the LIN-bus to the footwell module. In turn, the footwell module initiates activation of the adjustment motors.

To protect the mirror drive unit, the mirror adjustment is limited to a maximum activation time of 10 s. Activation is maintained within this period of 10 s until the mirror adjustment switch is released.

Activation is also maintained until the outside mirror blocks or reaches its end position.

## Detecting Position of Outside Mirrors

The Photochromatic outside mirrors have two potentiometers that register the mirror adjustment. The potentiometers receive their 5 V voltage supply from the electronic mirror module. The determined values of the potentiometers are stored in the footwell module for the memory function.

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## Mirror Heating

The mirror heating is operable as from terminal 15 ON.

On the standard variant the mirror heating is activated by the junction box control unit.

On the Photochromatic mirror the mirror heating is activated by the footwell module. The corresponding information is passed on to the electronic mirror module via the LIN-bus.

- The instrument cluster makes available the outside temperature value via the K-CAN.
- The junction box control unit provides the information for the wipers via the K-CAN.
- The percentage switch-on time is calculated from both values in the footwell module.

The following table shows the values for the percentage ON time.

Temperature in °C	<-10	-10 to 5	5 to 15	15 to 25	25 to 35	>35
Heating capacity in %	100	75	50	0	0	0
Heating capacity with wipers ON in %	100	100	75	50	25	0

The percentage increase is still retained for 300 s after the wiper is switched off. The maximum electric heating output is 28 W that is set by means of voltage and current measurement in the mirror.

## Low Voltage

The electronic mirror module switches off the mirror heating in the event of a low voltage condition.

- This has a positive effect on the charge balance of the battery. The cutout threshold is at 10.8V.
- The electronic mirror module switches on the mirror heating again as from a voltage of 11.6V.

## Terminal 50

During the start procedure, the starter outputs the "terminal 50 ON" status and the mirror heating is switched off during this period of time.

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## Auxiliary Heater

The mirror heating is switched on despite "terminal 15 OFF" in connection with the auxiliary heating (independent heating) system. The information for the mirror heating is provided via the K-CAN. The outside mirror heating is limited to 300 s when the auxiliary heating system is active.

## Mirror Fold-in

The mirror fold-in function is controlled by the footwell module. For this purpose, the footwell module requests the status of the mirror fold in switch. The driver's switch cluster evaluates the mirror fold-in switch and forwards the request via the LIN-bus. The footwell module initiates the fold-in function.

The electronic mirror module receives the request and executes this function by activating the corresponding fold-in motor. The footwell module receives the request via the LIN-bus. Both outside mirrors are folded in towards the vehicle thus reducing the vehicle width.

## Photochromatic Outside Mirrors

The automatic dip function (auto dimming) of the outside mirrors is dependent on the setting of the interior rear-view mirror. The function is available as from "terminal 15 ON".

The interior rear-view mirror sends the request to dip the mirrors directly to the roof functions center. In turn, the roof functions center makes the request available on the K-CAN.

The footwell module sends this request via the LIN-bus to the electronics in the outside mirrors.

## Outside Mirror with Memory Function

The outside mirror High features a memory function that is stored in the footwell module. Three memory locations are available for this purpose: They are:

- Current position when leaving the vehicle
- Memory position of memory button 1
- Memory position of memory button 2

## Remote Control

Up to three personalizable remote controls are possible per vehicle.

When the vehicle is locked using the remote control, the current mirror position is stored in the memory location for the key memory of the remote control currently used.

As a result, the mirror position last set, referred to the remote control used, is always reassumed when the vehicle is unlocked.

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## Storing Memory Position

The position of the outside mirrors is stored in the footwell module by pressing the "M" button followed by pressing one of the memory buttons within 7s. The driver's seat module evaluates the memory buttons and sends this information via the K-CAN.

## Calling Up Memory Position

When the memory button is pressed, the driver's seat module receives the request to adjust the outside mirrors to the memory position. The driver's seat module sends this request on the K-CAN. The footwell module evaluates the request and activates the memory position.

## Automatic Parking Function

The outside mirror on the front passenger's side is swivelled downward when reverse gear is engaged so that the curb can be easily viewed.

The automatic parking function is activated under following conditions:

- Terminal 15 ON and
- Reverse gear signal and
- Mirror selector switch set to driver position.

Note: The footwell module receives the reverse gear signal via the K-CAN. The automatic transmission control unit then makes this signal available.

## Folding Mirror Manually

The outside mirrors can be folded in or out manually. The mirrors could loose their set position when folded in or out manually. It may be therefore necessary to fold them out and fold them in and then back out again to reset them.

# Components

The following components are installed in the E70 for the purpose of operating the outside mirrors:

- Driver's door switch cluster with
  - Outside mirror adjustment switch
  - Outside mirror selector switch
  - LIN-bus link
- Outside mirrors
- Footwell module
- Junction box control unit
- Components for comfort/convenience function
  - Car access system 3
  - Driver's door lock cylinder
  - Remote control receiver in diversity module.

## Driver's Door Switch Cluster

The driver's door switch cluster is connected via the LIN-bus to the footwell module. The adjustment motors in the Low version of the outside mirrors are controlled directly by the mirror adjustment switch in the driver's door switch cluster.

The driver's door switch cluster in the High version of the outside mirrors is connected to the outside mirrors via the LIN-bus.

The electronic mirror module in the outside mirrors evaluates the LIN-bus signals and activates the adjustment motors.

Note: The driver's door switch cluster is connected to terminal 30g, terminal 31 and terminal 58g.

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## Drive Unit

The drive unit is accommodated in the housing of the outside mirror. Two different drive units are installed:

- Drive unit without memory function
- Drive unit with memory function

### Drive Unit without Memory

The drive unit without memory function consists of:

- Two DC motors with attached step-down gear mechanism and a slip clutch in the end positions
- Mirror heating
- Plug connection integrated in the housing
- Integrated interference suppression components

### Drive Unit with Memory

The drive unit with memory function additionally consists of the following components:

- Electronic mirror module
- Position potentiometer
- Folding mirror motor
- LIN-bus
- Photochromatic glass

## Footwell Module

The master function for controlling the outside mirrors is integrated in the footwell module. On vehicles with memory function, the mirror position of the respective memory button (driver's seat) is stored in the footwell module. The outside mirrors (high) and the driver's door switch cluster are connected to the footwell module via the LIN-bus. The outside mirror functions are activated via the LIN-bus.

## Junction Box Control Unit

The junction box control unit powers the low version of the outside mirror heating system. The signal is pulse width-modulated and has a frequency of 1 Hz.

## Roof Functions Center

The roof functions center serves the purpose of linking the interior rear-view mirror for the "automatic dipping/anti-dazzle" function of the outside mirrors.